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SEP 30 2004

Federal Communications Commission
Office of Secretary

September 30, 2004

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street, SW
Washington, DC 20554

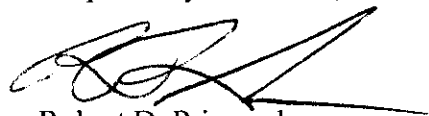
Re: *Petition for Rulemaking – Amendment of Part 15 Rules for
License-Exempt 57-64 GHz Band*

Dear Ms. Dortch:

On behalf of the Wireless Communications Association International, Inc. ("WCA") and pursuant to Section 1.401 of the Commission's Rules, we hereby submit an original and four (4) copies of the attached Petition for Rulemaking in which WCA requests amendment of certain Part 15 technical rules to promote broadband deployment in the license-exempt 57-64 GHz band.

Should there be any questions concerning this submission, please contact the undersigned.

Respectfully submitted,



Robert D. Primosch

Counsel to the Wireless Communications
Association International, Inc.

Attachments

cc: All parties listed on attached service list

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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SEP 30 2004

*Federal Communications Commission
Office of Secretary*

In the Matter of)
)
Amendment of the Commission's Rules) RM- _____
For the License-Exempt 57-64 GHz Band)
)
47 C.F.R. §15.255(b) and § 15.255(i))

PETITION FOR RULEMAKING

THE WIRELESS COMMUNICATIONS
ASSOCIATION INTERNATIONAL, INC.

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September 30, 2004

TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	DISCUSSION.....	5
A.	THE REQUESTED RULE MODIFICATIONS WILL PROMOTE ACCELERATED DEPLOYMENT OF VERY HIGH SPEED BROADBAND SERVICE AND FACILITIES-BASED COMPETITION WITH CABLE MODEM AND DSL SERVICES.....	5
B.	ADDING AN EIRP LIMIT TO SECTION 15.255(B)(1) WILL ACCELERATE PROVISION OF COMPETITIVE, GIGABIT-QUALITY BROADBAND SERVICE IN THE LICENSE-EXEMPT 57-64 GHZ BAND.	8
C.	THE COMMISSION SHOULD AMEND SECTION 15.255(I) TO CLARIFY THAT THE RULE'S TRANSMITTER ID REQUIREMENT DOES NOT APPLY TO ANTENNAS USED FOR WINDOW LINKS.....	14
III.	CONCLUSION.	15

EXECUTIVE SUMMARY

By this Petition for Rulemaking ("Petition"), the Wireless Communications Association International, Inc. ("WCA") asks the Commission to amend certain Part 15 technical rules relating to operation of wireless facilities in the license-exempt 57-64 GHz band. Adoption of the proposed rule amendments will optimize the 57-64 GHz band for very high speed broadband services without changing Part 15's technical parameters for the spectrum. If granted, WCA's proposal will unleash the 57-64 GHz band's potential as a vehicle for competitive broadband service over and above that currently offered by incumbent cable modem and DSL providers, without disrupting any existing or future uses of the spectrum.

By now the Commission's desire for robust facilities-based competition is well known. It therefore is significant that millimeter wave spectrum, and particularly the 57-64 GHz band, is an entry vehicle for new broadband service providers who seek to compete against incumbent cable modem and DSL providers. Indeed, technology has evolved such that relatively inexpensive, outdoor point-to-point links in 57-64 GHz band are now capable of delivering multi-gigabit broadband service at longer distances, enabling service providers to supply very high speed broadband service to an exponentially larger number of office buildings and other commercial properties in the enterprise market. That is a critical competitive advantage -- as broadband service becomes increasingly commoditized and incumbents further entrench themselves in the market, it will be virtually impossible for new broadband providers to compete solely on price. The ability to offer 100 Mbps to gigabit-speed services to a broader customer base thus gives users of the 57-64 GHz band a means of differentiating themselves from incumbent cable modem and DSL services, who generally do not offer 100 Mbps or faster services and cannot do so absent substantial additional capital investment.

This Petition requests revision of two Part 15 rules that are especially significant to users of the 57-64 GHz band. First, to ensure that transmitting antennas at 57-64 GHz comply with all relevant RF safety requirements, Section 15.255(b)(1) imposes power density ("PD") limits measured in the near-field, *viz.*, users of the spectrum are limited to a maximum average PD level of 9 $\mu\text{W}/\text{cm}^2$ and a maximum peak PD level of 18 $\mu\text{W}/\text{cm}^2$, both measured at a distance of 3 meters from the antenna. The Commission adopted these requirements nearly ten years ago under the assumption that the 57-64 GHz band would be used mostly for indoor wireless LAN deployments that utilize small, low gain antennas, where near-field PD measurements are practical and meaningful.

As a matter of physics, however, users of high gain, point-to-point outdoor antennas have substantial difficulty obtaining accurate measurements of PD levels in the near-field, and in any event near-field measurements for high gain, point-to-point outdoor antennas are a poor indicator of whether an antenna complies with the Commission's RF safety limits. First, measurements taken within an antenna near-field can vary significantly based on very small changes in the sampling location. For the wireless LAN products the Commission originally anticipated, a 3-meter sampling distance normally would be well within the antenna far-field, and thus provides a reliable correlation between the measured PD and the RF exposure levels near the antenna.

Conversely, the near-field for a high gain antenna typically extends beyond the 3-meter point, so there is little correlation between 3-meter PD measurements and the level of RF exposure near the antenna. In fact, due to the larger size of high gain antennas, a PD level very close to the antenna typically is *lower* than that for low gain antennas, even where transmit power levels are equal. In practice, then, PD levels for transmitters with high gain antennas are measured at longer distances, and thereafter theoretical analyses are done to extrapolate what the PD levels would be at 3 meters, even though the resultant values may or may not actually approximate the actual PD at 3 meters. Moreover, even if the calculated PD values do accurately approximate the actual PD level at 3 meters, they do not necessarily reflect the true RF exposure risk near the antenna.

The sum of the above is that transmitters using high gain antennas in the 57-64 GHz band are forced to operate at PD levels far below those permitted under the Commission's current RF safety limits. This, in turn, forces vendors to reduce transmit power to levels well below the maximum peak power permitted in Section 15.255(e) (27 dBm), thereby reducing link distance substantially. Indeed, under the current rules, link distances at 57-64 GHz usually are limited to less than 700 meters in most areas, even though most potential applications for 57-64 GHz products fall in the 800-1500 meter range. Since the economics and technical practicality of those applications are driven almost entirely by link distance, it is not difficult to see how the current rules are constraining 57-64 GHz deployments.

What is required, then, is an alternative to the current 3-meter PD rule that allows transmitters with high gain, point-to-point antennas to (1) use as much transmit power as permitted under Section 15.255(e), within the Commission's RF safety exposure limits, and (2) demonstrate compliance with those limits using a straightforward measurement technique. WCA believes that that the Commission can achieve this objective by adding an EIRP-based limit to the existing PD limits in Section 15.255(b)(1), under which average EIRP would be limited to 82 dBm less 2 dB for every dB that antenna gain is below 51 dBi. In addition to providing consistency with Part 15's use of EIRP in other license-exempt bands, adoption of WCA's proposal will give users of high gain, point-to-point 57-64 GHz antennas a full and fair opportunity to use all of the power they are permitted to use under Section 15.255(e) without running afoul of interference concerns or relevant RF safety limits. Furthermore, WCA's proposal imposes no additional burden on users of the 57-64 GHz band who plan to deploy indoor wireless LAN and other short range applications that are well suited for the existing PD limits – since those limits will be left intact, all users of the 57-64 GHz band will have the option of complying with the Commission's RF safety requirements by limiting either PD or EIRP. WCA's solution thus is a win-win for all affected parties, with users of broadband service the ultimate beneficiaries.

The second rule addressed in this Petition is Section 15.255(i), which imposes a transmitter identification ("ID") requirement on indoor antennas used at 57-64 GHz. The purpose of the rule is to permit users experiencing interference from indoor wireless LAN transmitters to more accurately identify where the interference is coming from. The rule thus applies the transmitter ID requirement to transmissions "that emanate from inside a

building.” Unfortunately, there remains some confusion over whether the rule’s exclusion of outdoor antennas also excludes antennas located indoors but directed outside a window, commonly referred to as “window links.” WCA believes it is reasonable to assume that the Commission did not intend to apply the rule to window links, since they effectively pose no greater interference risk than outdoor links. WCA therefore asks that the Commission eliminate any lingering uncertainty about this issue by modifying Section 15.255(i) to clarify that the rule’s transmitter ID requirement does not apply to indoor antennas that direct point-to-point transmissions outside through a window. This clarification will accelerate deployments of window links, which significantly reduce installation costs for shorter range outdoor links and, perhaps more important, are absolutely essential for providing service where a property owner refuses to give permission for rooftop or other common area outdoor installations.

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)
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Amendment of the Commission's Rules)
For the License-Exempt 57-64 GHz Band)
)
47 C.F.R. §15.255(b) and § 15.255(i))

RM- _____

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SEP 30 2004

Federal Communications Commission
Office of the Secretary

PETITION FOR RULEMAKING

The Wireless Communications Association International, Inc. ("WCA"), by its counsel and pursuant to Section 1.401 of the Commission's Rules, hereby submits this Petition for Rulemaking ("Petition") in which it requests amendment of certain Part 15 technical rules relating to operation of wireless facilities in the license-exempt 57-64 GHz band. For the reasons set forth herein, adoption of the proposed rule amendments will optimize the 57-64 GHz band for provision of facilities-based, competitive multi-hundred megabit and multi-gigabit broadband services without changing Part 15's technical parameters for the spectrum. WCA therefore respectfully urges the Commission to act on this Petition as soon as practicable, so that the marketplace may receive the benefits of the requested rule changes in the near term.

I. INTRODUCTION

WCA is the trade association of the wireless broadband industry. Its membership includes a wide variety of Commission licensees, system operators, equipment manufacturers and consultants interested in the domestic deployment of spectrum for wireless broadband service. WCA has been active in virtually every major Commission proceeding relating to wireless broadband spectrum, and has assumed a leadership role in

the Commission's mission to fulfill Congress's mandate that wireless broadband service is made available to all Americans in a reasonable and timely manner.¹ This is especially true with regard to millimeter wave spectrum – most recently, through its Over 40 GHz Committee (since renamed the “Over 60 GHz Committee”), WCA authored the core proposals that ultimately led to the Commission's adoption of a comprehensive regulatory framework for provision of broadband services in the 71-76, 81-86, and 92-95 MHz bands (herein referred to collectively as the “E-Band”).² The instant Petition, while more limited in scope, is designed to achieve the same fundamental objective, *i.e.*, promote use of millimeter wave spectrum as a “new and fertile ground for our Nation's entrepreneurs to harvest [the Commission's] vision of strong facilities-based competition, vibrant innovation, lower prices and consumer protection.”³

WCA proposes modification of two Part 15 rules that have become outmoded due to technological and marketplace developments in the 57-64 GHz band. First, to ensure that compliance with all relevant RF safety requirements, Section 15.255(b)(1) requires users of the 57-64 GHz band to comply with power density (“PD”) limits measured in the near-field, *viz.*, users of the spectrum are limited to a maximum average PD level of 9 $\mu\text{W}/\text{cm}^2$ and a maximum peak PD level of 18 $\mu\text{W}/\text{cm}^2$, both measured at a distance of 3 meters from the transmitting antenna. The Commission adopted these requirements nearly ten years ago under the assumption that the 57-64 GHz band would be used primarily for indoor, low power wireless LAN deployments, where near-field PD

¹ See Telecommunications Act of 1996, Section 706(a)

² See *Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands*, 18 FCC Rcd 23318 (2003).

³ *Id.*, Separate Statement of Chairman Michael K. Powell, 18 FCC Rcd at 23380.

measurements are practical and meaningful. Within the past few years, however, the 57-64 GHz band has moved well beyond indoor wireless LAN applications – vendors have developed high gain, point-to-point outdoor antennas for the 57-64 GHz band that enable links as long as 1000 meters (under ideal conditions) and thus dramatically improve the economics of delivering competitive multi-gigabit broadband service, particularly to the enterprise market.⁴

As a matter of physics, however, users of high gain, point-to-point outdoor antennas have substantial difficulty obtaining accurate measurements of PD levels in the near-field.⁵ This, in turn, requires users to rely on mathematical formulae to determine what power levels are permissible given the PD limits under Section 15.255(b)(1). Those calculations always produce the same result: to satisfy the PD levels in Section 15.255(b)(1), users of high gain, point-to-point antennas in the 57-64 GHz band must transmit at very low power levels, *viz.*, usually between 0 and 10 dBm, exponentially below the 27 dBm (500 mW) peak power limit afforded to them under Section 15.255(e). Clearly, this imposes an artificial constraint on use of high gain, point-to-point outdoor antennas in the 57-64 GHz band (and the concomitant benefits of gigabit-level broadband service) with no countervailing benefit to the public.

⁴ These vendors include BridgeWave Communications, Inc; Ceragon Networks; TeraBeam; and 6015, Inc.

⁵ By virtue of their physical size, high gain antennas have very large near-fields, and therefore measurements taken just 3 meters away run a substantial risk of material error absent measurement techniques that are difficult and expensive. Moreover, measurement techniques and results typically vary between test labs, rendering near-field measurements even more impractical. Lastly, near-field PD levels measured at 3 meters do not correlate well with PD levels present at other distances, and thus are not a reliable barometer of compliance with the Commission's RF exposure limits where high gain, point-to-point antennas are used.

Hence, WCA believes the Commission can and should eliminate the problem simply by adding an EIRP limit to Section 15.255(b)(1), such that users of high gain, point-to-point antennas the 57-64 GHz band will be deemed in compliance with the rule if they transmit an average EIRP of no more than 82 dBm, with a reduction of 2 dB for every dB that the transmitting antenna gain is below 51 dBi. In addition to providing consistency with Part 15's use of EIRP in other license-exempt bands, adoption of WCA's proposal will give users of high gain, point-to-point 57-64 GHz antennas a full and fair opportunity to use all of the power they are permitted to use under Section 15.255(e), without running afoul of any interference concerns or relevant RF safety limits.

The second rule addressed in this Petition is Section 15.255(i), which imposes a transmitter identification ("ID") requirement on indoor antennas used at 57-64 GHz. The purpose of the rule is to permit users experiencing interference to more accurately identify where the interference is coming from. In turn, since interference in the 57-64 GHz band is more likely to occur indoors (due to the absence of significant RF oxygen absorption and the presence of low-gain WLAN antennas), the transmitter ID requirement has been limited to indoor antennas only. It is less clear, however, how the rule applies to antennas located indoors but directed outside through a window (known in the industry as "window links"), such that they effectively function like outdoor antennas and thus create a similarly negligible interference risk. The marketplace confusion over this issue has created a cloud of regulatory uncertainty over deployment of window links, which outdoor, point-to-point 57-64 GHz operators absolutely must have where a landlord refuses to grant roof rights or other rights of entry necessary for outdoor antenna

installations. Accordingly, should the Commission determine that enforcement of Section 15.255(i) continues to be in the public interest, it should treat window links as it would any outdoor link under the rule, and clarify that transmitter ID requirement does not apply to point-to-point transmissions that are directed outside through a window.⁶

II. DISCUSSION

A. **The Requested Rule Modifications Will Promote Accelerated Deployment of Very High Speed Broadband Service and Facilities-Based Competition With Cable Modem and DSL Services.**

As a threshold matter, there are strong policy grounds for adoption of WCA's proposal. Certainly, it is no secret that the United States is losing the global race to deploy very high speed broadband service. As recently noted in *Business Week*: "[T]he U.S. is becoming something of a broadband backwater. . . [It] has steadily fallen behind other nations, both in terms of the share of the population with broadband and the speed of those connections."⁷ Appropriately, then, the Commission has remained tightly focused on regulatory reforms that will promote facilities-based competition with the incumbent cable modem and DSL services that presently supply virtually all broadband service in the United States:

We remain committed to removing obstacles to competitive entry into local telecommunications markets by any of the avenues contemplated in the 1996 Act. Nonetheless, we have recognized that the greatest long-term benefits to consumers will arise out of competition by entities using their own facilities. Because facilities-based competitors are less dependent than other new entrants on the incumbents' networks, they have the greatest ability and incentive to offer innovative technologies and service options to consumers. Moreover, facilities-based competition

⁶ The recommended text for the rule changes proposed in this Petition is attached hereto as Exhibit 1.

⁷ Yang, "Behind in Broadband," *Business Week*, at 88 (Sept. 6, 2004).

offers the best promise of ultimately creating a comprehensive system of competitive networks, in which today's incumbent LECs no longer will exert bottleneck control over essential inputs, but will compete on a more equal basis with their rivals.⁸

Consistent with the above, the Commission has long recognized millimeter wave spectrum, and particularly the license-exempt 57-64 GHz band, is a viable entry vehicle for new facilities-based broadband service providers. Indeed, when the Commission established the initial license-exempt allocation at 59-64 GHz, it stated that "[a]n important goal of this proceeding is to foster the development of novel broadband communications systems. We believe that the 59-64 GHz band offers the greatest potential for allowing the development of short-range wireless radio systems with communications capabilities approaching those now achievable only with coaxial and optical fiber cable."⁹ Similarly, when the Commission subsequently added the 57-59 GHz band to the allocation, it observed that "this additional unlicensed spectrum (used either separately or in conjunction with the 59-64 GHz band) will be very useful for very high speed and/or high bandwidth communications over short distances and for networking backbone purposes in congested areas."¹⁰

Now, however, the combination of low-cost license-exempt operation and technology improvements has led to development of relatively inexpensive, outdoor

⁸ *Promotion of Competitive Networks in Local Telecommunications Markets*, 15 FCC Rcd 22983, ¶ 4 (2000).

⁹ *Amendment of Parts 2, 15 and 97 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications*, 11 FCC Rcd 4481, 4488 (1995) ["59-64 GHz First Report and Order"].

¹⁰ *Amendment of Part 2 of the Commission's Rules to Allocate Additional Spectrum to the Inter-Satellite, Fixed, and Mobile Services and to Permit Unlicensed Devices to Use Certain Segments in the 50.2-50.4 GHz and 51.4-71.0 GHz Bands*, 15 FCC Rcd 25264, 25265 (2000) ["57-59 GHz Report and Order"].

point-to-point links in 57-64 GHz band that can deliver up to multi-gigabit speed broadband services, at distances that enable operators to reach an exponentially larger number of office buildings and other commercial properties in the enterprise market. That is a critical competitive advantage -- as broadband service becomes increasingly commoditized and incumbents further entrench themselves in the market, it will be virtually impossible for competitive providers to compete solely on price. The ability to offer multi-hundred megabit and multi-gigabit speed service to a broader customer base thus provides 57-64 GHz service providers with a means of differentiating themselves from cable modem and DSL services, who generally do not offer broadband service at equivalent speeds and cannot do so absent substantial additional capital investment.¹¹

In sum, 57-64 GHz operators give end-users access an attractive alternative to incumbent wired services, and thereby fuel the competition necessary to motivate all service providers to offer higher speed broadband services at lower price points. That is exactly the marketplace dynamic that the Commission hopes to achieve with facilities-based competition – grant of the instant Petition will bring it another step closer to that result.

¹¹ By way of example, 57-64 GHz links using BridgeWave's 60 GHz GigE equipment are currently used to provide 100 Mbps fully-symmetric Internet access services for a price of \$1,000 per month. While that price is higher than that for conventional business DSL (usually about \$200 per month) or T1 services (about \$700 per month), customers find that the additional cost is more than justified by the performance improvements achievable via BridgeWave's equipment, permitting applications such as very high performance virtual private network access, distance learning, video conferencing, and other advanced services not available from incumbent providers. BridgeWave's GigE links are also used to extend LAN backbones between building sites where end users were unable to purchase equivalent services from network operators at acceptable price points. Providing end-users with the means to deploy their own private network links will impose competitive pressure that should force incumbents to improve the performance and prices of their service offerings.

B. Adding an EIRP Limit to Section 15.255(b)(1) Will Accelerate Provision of Competitive, Gigabit-Quality Broadband Service in the License-Exempt 57-64 GHz Band.

Where Part 15 is concerned, the Commission has emphasized that “as technology evolves, we must amend our rules from time to time so that innovation is not discouraged.”¹² Thus, the Commission has strived to adopt Part 15 rules that “represent a reasonable engineering compromise between the risks of increased interference and the desire to accommodate new technologies.”¹³ As shown below, WCA’s Petition fully satisfies that standard.

Although well-intentioned, it is apparent that the PD limits in Section 15.255(b)(1) are having a counterproductive effect on deployment of new technologies in the 57-64 GHz band. Essentially, the PD limits were adopted for two reasons. First, the Commission found that the PD limits in the rule were necessary to “ensure that unlicensed millimeter wave systems comply with the relevant RF safety standards.”¹⁴ Second, the primary proponents of the allocation were proposing to use the band for services such as “premises communication” (e.g., wireless LANS, campus-wide links, roadway communications, etc.) and computer-to-computer links, which generally are very short range, low power, mostly indoor point-to-multipoint applications that allow for accurate PD measurements in the near-field. Although a small number of parties had

¹² *Amendment of Part 15 of the Commission’s Rules Regarding Spread Spectrum Devices*, 15 FCC Rcd 16244, 16249 (2000).

¹³ *Id.*

¹⁴ *59-64 GHz First Report and Order*, 15 FCC Rcd at 4493; see also *id.* at 4499 (“[The 9 uW/cm² PD limit] would seem to be a reasonable approach in allowing manufacturers the necessary power density to be able to communicate effectively while generally ensuring that the public would not be exposed to RF fields in excess of the safety standards.”).

suggested that the spectrum could be used for higher power point-to-point links that could serve longer distances, it appears that the Commission focused primarily on the lower power applications (including those that use equipment that consumers can buy off the shelf) where the risk of a consumer coming into the path of transmission is much higher.¹⁵ Moreover, although the Commission rejected a proposal to replace PD limits with EIRP limits, it did not consider the possibility of adding EIRP limits as an *alternative* to PD limits for transmitters utilizing high-gain antennas, where it could be shown that compliance with the EIRP limits would satisfy any RF safety concerns.¹⁶

It has now been nearly ten years since the Commission adopted the PD limits in Section 15.255(b)(1). Since that time, vendors have been developing high gain, point-to-point antennas for the 57-64 GHz band that can deliver multi-gigabit speed outdoor links as long as 1,000 meters, well in excess of what was anticipated when the Commission initially adopted the allocation. Yet, for the reasons discussed in Section I *supra*, the PD limits in Section 15.255(b)(1) limit such antennas to an artificially low power level with no corresponding benefit to the public. This situation is an anathema to the Commission's pro-competitive, pro-consumer policies for Part 15 services.¹⁷ What is

¹⁵ *Id.* (“We do not find it acceptable to permit operation of unlicensed millimeter wave systems at the levels requested by HCP and Apple. Such levels would result in a relatively large area near the millimeter wave system in which people may be present and the RF fields would exceed the safety standards. . . . Unlicensed devices are often sold directly to consumers who have little knowledge of RF safety issues. Because of this, we must, in most cases, require that unlicensed millimeter wave systems be limited in power density to levels that ensure safe operation in places and at distances where people are likely to be located.”)

¹⁶ *See id.* at 4499-4450

¹⁷ *See, e.g., Revision of Part 15 of the Rules Regarding the Operation of Radio Frequency Devices Without An Individual License*, 4 FCC Rcd 3493 (1989) (stating Commission's goal of “achiev[ing] more effective use of the radio frequency spectrum while providing additional technical and operational flexibility in the design, manufacture and use of non-licensed devices.” (“1989 Part 15 First Report and Order”).

required, then, is a rule that permits high gain, point-to-point antennas to demonstrate compliance with the relevant RF safety limits by reference to EIRP, such that they are able to operate with as much power as permitted under Section 15.255(e) (27 dBm), as long as they comply with the relevant RF safety limits. WCA believes that this objective can be achieved by adding an EIRP-based alternative to the existing PD limits in Section 15.255(b)(1), under which average EIRP would be limited to 82 dBm less 2 dB for every dB that antenna gain is below 51 dBi.

The benefits of this rule amendment will be significant. First, as noted above, compliance with the PD limits in Section 15.255(b)(1) effectively limits users of high gain, point-to-point 57-64 GHz antennas to power levels between 0 and 10 dBm. Assuming use of a 12-inch transmitting antenna, this means that outdoor link distances at 57-64 GHz typically are limited to 700 meters in most U.S. cities.¹⁸ WCA has determined that if its proposed amendment to Section 15.255(b)(1) were in effect right now, it would be possible with current technology to deploy a 12-inch high gain, point-to-point 57-64 GHz antenna at a power level of 17-22 dBm (*i.e.*, still well-below the 27 dBm peak power limit in Section 15.255(e)), and that such a transmitter would comply with the Commission's Maximum Permitted Exposure ("MPE") limit.¹⁹ At 17 dBm (a power level readily achievable today with a low-cost design), link distances increase to a minimum of 1,000 meters, increasing the number of building pairs served by a factor of

¹⁸ Washington, D.C. would be an example of this. In cities subject to higher levels of rainfall, such as Miami, FL, link distances normally would be limited to 500 meters. Conversely, in cities with materially less rainfall, such as Boise, Idaho, link distances typically are as high as 900 meters.

¹⁹ WCA has calculated that a 12-inch antenna in the 57-64 GHz band could operate at levels as high as 22 dBm and remain in compliance with the Commission's RF safety rules.

two.²⁰ For a 24-inch antenna, the increase is even more dramatic – assuming a power level at the 27 dBm maximum (which, again, would be in compliance with the Commission’s MPE limit), link distance increases to a minimum of 1,500 meters (commonly known as the “sweet spot” for outdoor point-to-point applications in the enterprise market), and the number of building pairs that can be served increases by a factor of four. Thus, regardless of the size of the antenna used, the economics of delivering multi-gigabit connections via wireless technology become substantially better under WCA’s proposal. That scenario, obviously, redounds to the benefit of end-users who presently are confined to a choice of incumbent cable modem and DSL providers offering lower-performance broadband services.

Second, the low cost of deploying license-exempt links at 57-64 GHz makes them an ideal choice for enterprise LAN-extension applications. This is particularly significant for existing wireless LAN bridges that currently deploy longer range links in the license-exempt 5 GHz band. Currently, 5 GHz links offer performance levels between 10 and 100 Mbps – without access to 57-64 GHz links, users at 5 GHz will have no natural growth path to gigabit-speed services. Furthermore, transmission sites with multiple co-located 5 GHz wireless bridge links often experience interlink interference due to their wide antenna beamwidths. Conversely, 57-64 GHz links have extremely narrow beamwidths (two degrees or less) and thus permit users to deploy multiple additional links at sites where 5 GHz links are already installed.²¹

²⁰ In the wireless industry, a rule of thumb is that the number of building pairs served increases with the square of the distance of the link, since the area of a circle increases with the square of the radius.

²¹ In addition, 57-64 GHz links will often be used to provide redundancy with Free Space Optic (“FSO”) gigabit links or lower frequency 100 Mbps links. In these cases, the maximum link

Third, WCA's proposal will not increase interference within or in spectrum adjacent to the 57-64 GHz band. That is, WCA is *not* asking the Commission to increase the 27 dBm peak power limit or any pertinent out-of-band emission restrictions. And, it is well settled that environmental factors significantly mitigate the interference potential of millimeter wave outdoor links.²² That will continue to be the case in the 57-64 GHz band after adoption of WCA's proposal.

Lastly, WCA's proposed EIRP limit will permit users of high gain, point-to-point links at 57-64 GHz to remain well within the Commission's RF safety requirements for that spectrum. The MPE limits in Section 1.1310 of the Commission's Rules permit deployment of non-professionally installed 57-64 GHz antennas at a PD of up to 1 mW/cm² ("the "General Population MPE Limit"), and deployment of professionally installed 57-64 GHz antennas at a PD level of up to 5 mW/cm². Although the latter is more relevant to outdoor antenna installations on rooftops or other sites not accessible to the end-user, WCA's Over 60 GHz Committee has analyzed whether compliance with the proposed average EIRP limit of 82 dBm (less the specified adjustments for antenna

distance of the 57-64 GHz band normally will limit the link distance of the entire system. Therefore, increasing link distances at 57-64 GHz will increase the range of the combined redundant link.

²² See, e.g., *59-64 GHz First Report and Order*, 11 FCC Rcd at 4484 n.6 ("The propagation of millimeter wave radio signals is more limited than that of radio signals at lower frequencies. Signals in the millimeter wave bands are significantly affected by the presence of oxygen and water vapors within the atmosphere. Absorption and scattering caused by oxygen and water vapor limit the range of millimeter wave transmissions to a few kilometers almost regardless of the power used. . . . Attenuation caused by oxygen is significant throughout the millimeter wave spectrum, but increases dramatically at frequencies around 60 GHz and 120 GHz. Attenuation caused by water vapor varies based on temperature and relative humidity but generally increases with frequency. Rain, snow, hail, and fog can all affect the range of millimeter wave transmissions." (citation omitted)).

gain below 51 dBi) would permit compliance with the more stringent General Population MPE Limit.

As indicated by the spreadsheet attached hereto as Exhibit 2, assuming use of the aperture peak power density formula in OET Bulletin No. 65 (which already includes a 4x margin to account for variances in the PD across the aperture),²³ and using a 50% antenna efficiency factor, limiting EIRP to 82 dBm less 2 dB for every dB that antenna gain is below 51 dBi will permit antennas using the EIRP-based formula to remain in compliance with the General Population Exposure Limit (“GPE Limit”). The spreadsheet computes the PD at the aperture of a parabolic dish antenna for various size antennas, and calculates typical antenna gain for each antenna size and the transmit power that would be permitted under the EIRP limit proposed herein. Lastly, the analysis compares the proposed EIRP-based transmit power limit to the effective transmit power limit based on compliance with the General Population MPE Limit ($1\text{mW}/\text{cm}^2$) and to the absolute transmit peak power limit specified in Section 15.255(e). In total, the spreadsheet demonstrates how WCA’s proposed EIRP limit permits higher transmit power as gain and aperture size increase for point-to-point antennas, without causing the antennas to exceed the Commission’s RF safety limits.

In sum, there is ample justification for adoption of WCA’s proposed EIRP limit, particularly as it will have no cognizable impact on interference or compliance with RF safety. Nor will WCA’s proposal burden users of the 57-64 GHz band who may in the future deploy indoor wireless LAN and other short range applications that are better suited to use the existing PD limits – WCA leaves those limits intact, so that all users of

²³ $S = 4$ multiplied by P/A , where S = maximum power density at antenna surface; P =power fed to the antenna and A = the area of the antenna aperture.

the band have the option of complying with the Commission's RF safety requirements either by limiting PD or EIRP. WCA's solution thus is a win-win for all affected parties, with users of broadband service the ultimate beneficiaries.

C. The Commission Should Amend Section 15.255(i) To Clarify That the Rule's Transmitter ID Requirement Does Not Apply to Antennas Used For Window Links.

As currently written, Section 15.255(i) of the Commission's Rules states in relevant part that transmissions "that emanate from inside a building" must transmit a transmitter ID at least once. In the *57-59 GHz Report and Order*, the Commission determined that limiting the rule to indoor facilities would "protect the systems for which it was designed, *i.e.*, transmissions that emanate from inside a building. This minor alteration should protect indoor systems from interference, while not unnecessarily burdening outdoor systems that pose little interference threat to indoor systems or other outdoor systems."²⁴

Unfortunately, there remains some confusion over whether the rule's exclusion of outdoor antennas also excludes antennas located indoors but directed outside a window, or "window links." Although the *57-59 GHz Report and Order* does not discuss the issue, WCA believes it is reasonable to assume that the Commission did not intend to apply the rule to window links, since they effectively pose no greater interference risk than outdoor links. Tests of 57-64 GHz link propagation through commercial glass samples confirm that many common window glass types have RF attenuations of as little

²⁴ *57-59 GHz Report and Order*, 15 FCC Rcd at 25281.

as 4 dB, even when the radio is aimed at an angle to the glass.²⁵ This means that in many cases window links offer a practical alternative to roof-mounted antennas.

WCA therefore submits that the Commission should eliminate any lingering uncertainty about this issue by modifying Section 15.255(i) to clarify that the rule's transmitter ID requirement does not apply to indoor antennas that direct point-to-point transmissions outside through a window. This clarification will accelerate deployments of window links, which significantly reduce installation costs for shorter range outdoor links and, perhaps more important, are absolutely essential for providing service where a property owner refuses to give permission for rooftop or other common area outdoor installations, which regrettably continues to be an impediment to installation of wireless broadband service in the commercial arena.

III. CONCLUSION.


WCA's proposed rule changes provide the Commission with an opportunity to unleash the 57-64 GHz band's potential as a vehicle for truly competitive, very high speed Internet service that can be provided at relatively low cost. Furthermore, the proposed rule changes can be implemented without disrupting Part 15's basic technical framework for the spectrum or otherwise prejudicing any existing or future user thereof. WCA's Petition thus fully serves the public interest. Accordingly, WCA asks that the

²⁵ Good side/back lobe suppression is typical in 57-64 GHz antennas. Adoption of WCA's proposed EIRP limit does not change the analysis here, since the EIRP limit requires narrower beams and/or reduction of power to ensure compliance with the Commission's RF safety requirements and Section 15.255(e)'s peak power limit. Thus, use of the EIRP limit will not significantly increase any existing risk of interference to indoor facilities.

Commission issue a *Notice of Proposed Rulemaking* on WCA's proposals and amend its rules as requested herein.

Respectfully submitted,

THE WIRELESS COMMUNICATIONS
ASSOCIATION INTERNATIONAL, INC.

A handwritten signature in black ink, appearing to read 'PJS', is written over a horizontal line.

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September 30, 2004

EXHIBIT 1

Recommended Text for Proposed Rule Changes

1. Replace 15.255(b)(1) with the following text (new matter is underscored):

(1) For products other than fixed field disturbance sensors, at least one of the following limits must be met:

(i) The average power density of any emission, measured during the transmit interval, shall not exceed $9 \mu\text{W}/\text{cm}^2$, as measured 3 meters from the radiating structure, and the peak power density of any emission shall not exceed $18 \mu\text{W}/\text{cm}^2$, as measured 3 meters from the radiating structure.

(ii) The average EIRP of any transmitter, measured during the transmit interval, shall be limited to the value of 82 dBm reduced by a factor of 2 dB for every dB that the transmit antenna far-field gain is less than 51 dBi.

2. Insert language into the first sentence of 15.255(i) as follows:

(i) For all transmissions that emanate from inside a building, except for point-to-point transmissions that are directed outside through a window, within any one second interval of signal transmission, . . .

EXHIBIT 2

Peak Power Density at Antenna Aperature for 60GHz (mW/cm^2)

		Antenna Diameter														
		in.	4	6	8	10	12	16	20	24	28	32	36	40	44	48
		cm.	10.2	15.2	20.3	25.4	30.5	40.6	50.8	61.0	71.1	81.3	91.4	101.6	111.8	121.9
(Approx. dBi		33.1	36.6	39.1	41.0	42.6	45.1	47.1	48.7	50.0	51.1	52.2	53.1	53.9	54.7	
Average Tx Power (dBm)	0	0.05	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1	0.06	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2	0.08	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3	0.10	0.04	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4	0.12	0.06	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5	0.16	0.07	0.04	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6	0.20	0.09	0.05	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7	0.25	0.11	0.06	0.04	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	8	0.31	0.14	0.08	0.05	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	9	0.39	0.17	0.10	0.06	0.04	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
	10	0.49	0.22	0.12	0.08	0.05	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
	11	0.62	0.28	0.16	0.10	0.07	0.04	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00
	12	0.78	0.35	0.20	0.13	0.09	0.05	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
	13	0.98	0.44	0.25	0.16	0.11	0.06	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01
	14	1.24	0.55	0.31	0.20	0.14	0.08	0.05	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01
	15	1.56	0.69	0.39	0.25	0.17	0.10	0.06	0.04	0.03	0.02	0.02	0.02	0.02	0.01	0.01
	16	1.96	0.87	0.49	0.31	0.22	0.12	0.08	0.05	0.04	0.03	0.02	0.02	0.02	0.02	0.01
	17	2.47	1.10	0.62	0.40	0.27	0.15	0.10	0.07	0.05	0.04	0.03	0.02	0.02	0.02	0.02
	18	3.11	1.38	0.78	0.50	0.35	0.19	0.12	0.09	0.06	0.05	0.04	0.03	0.03	0.03	0.02
	19	3.92	1.74	0.98	0.63	0.44	0.24	0.16	0.11	0.08	0.06	0.05	0.04	0.04	0.03	0.03
	20	4.93	2.19	1.23	0.79	0.55	0.31	0.20	0.14	0.10	0.08	0.06	0.05	0.05	0.04	0.03
	21	6.21	2.76	1.55	0.99	0.69	0.39	0.25	0.17	0.13	0.10	0.08	0.06	0.06	0.05	0.04
	22	7.82	3.48	1.95	1.25	0.87	0.49	0.31	0.22	0.16	0.12	0.10	0.08	0.08	0.06	0.05
	23	9.84	4.38	2.46	1.58	1.09	0.62	0.39	0.27	0.20	0.15	0.12	0.10	0.08	0.08	0.07
	24	12.39	5.51	3.10	1.98	1.38	0.77	0.50	0.34	0.25	0.19	0.15	0.12	0.10	0.10	0.09
	25	15.60	6.93	3.90	2.50	1.73	0.98	0.62	0.43	0.32	0.24	0.19	0.16	0.13	0.13	0.11
	26	19.64	8.73	4.91	3.14	2.18	1.23	0.79	0.55	0.40	0.31	0.24	0.20	0.16	0.16	0.14
	27	24.73	10.99	6.18	3.96	2.75	1.55	0.99	0.69	0.50	0.39	0.31	0.25	0.20	0.20	0.17
	28	31.13	13.84	7.78	4.98	3.46	1.95	1.25	0.86	0.64	0.49	0.38	0.31	0.26	0.26	0.22
	29	39.19	17.42	9.80	6.27	4.35	2.45	1.57	1.09	0.80	0.61	0.48	0.39	0.32	0.32	0.27
	30	49.34	21.93	12.33	7.89	5.48	3.08	1.97	1.37	1.01	0.77	0.61	0.49	0.41	0.41	0.34

Antenna efficiency 50%

Wavelength 0.5 cm.

Anisotropic power density safety margin 400% (degree to which power is not spread evenly across aperature area)
(per formula from OET Bulletin 65)

Proposal: Limit average EIRP to 82dBm minus 2dB per dB antenna gain below 51dBi to keep power density below 1mW/cm^2

EIRP limit	46.2	53.2	58.2	62.1	65.3	70.3	74.1	77.3	80.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
Avg power limit	13.1	16.6	19.1	21.0	22.6	25.1	27.1	28.7	30.0	30.9	29.8	28.9	28.1	27.3	27.3	27.3

Note: 15.255e limits peak power to 27dBm

CERTIFICATE OF SERVICE

I, Michelle A. Bynum, hereby certify that on the 30th day of September 2004, copies of the foregoing "Petition for Rulemaking – Amendment of Part 15 for License-Exempt 57-64 GHz Band" have been hand delivered to the following:

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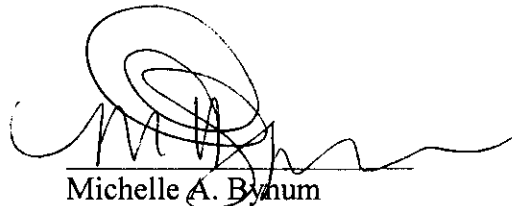
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